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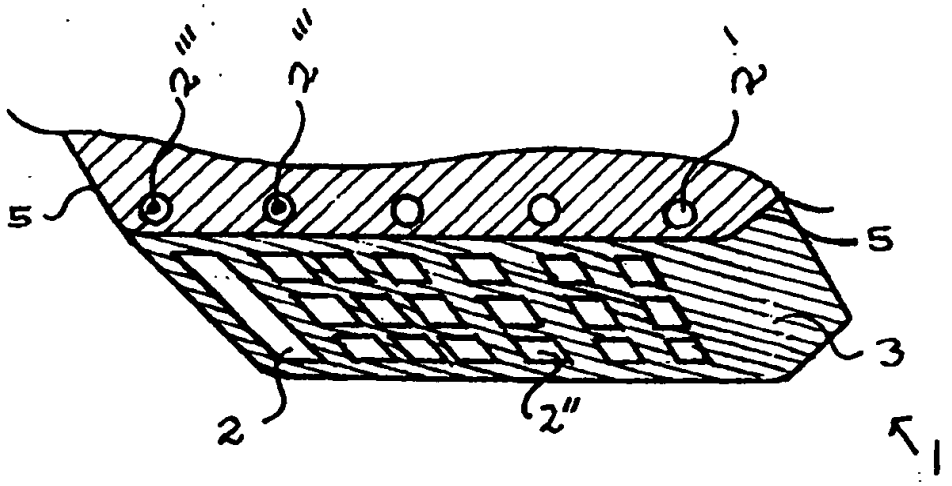

(57) Abstract

The invention relates to a method of transferring a layer onto a detail (8) which shields against electromagnetic radiation. The layer (3, 7) is transferred with a predetermined extension directly or indirectly on to the detail (8) with the help of a known printing method.

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METHOD OF PRODUCING A METALLIC LAYER ON THE SURFACE OF A DETAIL FOR SHIELDING AGAINST ELECTROMAGNETIC RADIATION

In our surroundings there are a large number of electromagnetic fields which are formed by electrical machines and electrical equipment, such as radios, TVs, refrigerators, deepfreezes, stoves, electric ovens, computers, car- and pocket telephones, electrical conductors, power tools, lamps and a number of other devices. These electromagnetic fields, which surrounds us every day, probably cause a number of symptoms for people who are allergic to this radiation, in the form of different allergies, cancers of different types and other complaints.

There are today different forms and methods for trying to reduce the effect of the electromagnetic field on people through different types of screening methods.

The electromagnetic radiation can be reduced through shielding the radiating unit with a metallic casing, which can contain the electromagnetic field and thereby reduce the risk of injury to people.

These shielding devices can be made, for example, as an enclosing casing, formed of a net of metal wires or of a metallic foil or from a surface which is metallized through vacuum vaporisation or the structural plastic material in the device can be completely or partially mixed with metal fragments.

The protective effect is thus achieved through placing an obstacle in the radiation direction which shields at least at the place where it is desired to avoid radiation from the electromagnetic field or to shield larger surfaces than that.

To produce this shielding is often expensive and complicated and sometimes does not give an esthetically attractive result. To shield, for example, through clothing the electrical devices with a net or foil does not look nice and furthermore makes it difficult to operate and access them. Internal solutions, such as foils moulded-in or

mechanically mounted become both expensive and complicated. If a surrounding casing of plastic is constructed with an electrically conductive material baked into the plastic then the casing becomes unnecessarily heavy and furthermore expensive to produce. since the material cost becomes high and the operating time in an injection mould takes a long time. A vacuum vaporisation method is suitable for producing a surface coating of a thin metallic layer. This method causes problems in the form of difficult handling. First the details must be unpacked. Then comes masking of surface which it is not desired to coat with metal, then hanging up on different stands and then introduction into the autoclave which is then evacuated of air in order to produce a vacuum. It is only after this that the metallization through vacuum vaporisation can take place. Thereafter follows demounting of the metallized details, which will be packaged and transported to the manufacturer of the electrical devices. Vacuum vaporisation plants costs many millions of Swedish crowns which adds to the cost for each metallized detail. Metallization which is performed with anodisation has similar disadvantages as the vacuum vaporisation method.

All the above described methods are both time-consuming, labour-intensive and expensive at the same time as the quality of the metallic layer developed is not always sufficiently good.

The present invention is intended to solve the above mentioned problems.

It is known in the prior art to transfer a non-cured or undried paint substance to a foundation from a stamp pad which can be coated with paint in different ways. For example the paint can be pressed through a template against a plate where a picture is etched with the exact shape, spread, thickness and colour. A soft and pliable stamp pad then gets this picture through being pressed against this surface and then transfers this to a pre-determined place on a surface of a detail, for example, a pen, a clockface, a toy or some other detail surface, which can be arched, curved or have another simple surface shape. The picture can also be taken from a screen printed picture. The stamp pad is shaped so that it can follow the different shaped surfaces

so that the picture is transferred and covers in the best way the whole of its surface so that no part of the picture is left out. This method is known as "tampon-printing".

According to the invention the advantages of tampon-printing can be used through exchanging the printing ink for a metallic material which then forms a shielding layer against electromagnetic radiation. According to the invention masking of surfaces which are not to be metallized, for example, the front side, the making of holes, fittings, join surfaces etc. becomes unnecessary as the shape, thickness and extension of the print is regulated exactly with this tampon-printing method. According to the invention, by further refining this known printing method, much more complicated surface shapes can be coated with a metallized layer so that even extremely arched and complicated surfaces with projecting elements or fittings and the like can be coated. The stamp pad can in this case be shaped more exactly so that it in general fits the detail which is to be coated with a layer. One can in this case produce the stamp pad in an extra soft and flexible material so that it can stretch itself into the smallest nook. Smaller details with extremely complicated shapes, for example, car telephone cases, become easier to coat with a layer since the tampon-printing method according to the invention is especially easy to perform on small surfaces. All handling such as placing in or removing out of details for metallization in a vacuum vaporisation method does not have to be performed according to the invention. Injected moulding plastic material with a metal mixed in does not need to be used either. Instead, according to the invention, the structural material which normally is needed for the purposes is used. To place in or glue fast a metal casing also becomes unnecessary, as well as making of different types of nets.

According to the present invention a cheap, quick and particularly easy method of obtaining a metallic layer as a shield against electromagnetic radiation on a detail which is to be used in a electrical device is provided. Furthermore the method according to the invention gives an extremely high quality result. According to the

invention the metallic layer is transferred with a pre-determined spread directly or indirectly on to the actual detail with the help of a known printing method. As a printing method can be used, for example, a photographic method in order to produce an exactly shaped picture. This picture is then transferred through etching to the surface on a plate. It can also be transferred to a screen frame. A metallic material is then laid out as a thin layer on the etched plate or pressed through the screen frame out onto a foundation. The now printed metal layer is then collected by a tampon stamp pad which then transfers this to, for example, a casing for a car telephone. Application of this metallic layer according to the invention only takes a few seconds. This must be compared with the vacuum vaporisation method, which is up to now the most successful form, for example car telephone casings, which requires masking devices which are large, clumsy and difficult to handle, and which can only be delivered after several days, which is extremely time-consuming.

Naturally all the surfaces of the metallic layer according to the invention do not have to be tampon printed at the same time. The same detail can be printed more than one time in different places. With small series or in the case that the details are small, it is most profitable to use smaller tampon printing pads and printing machines. With large series, and in the case large bits should be coated, according to the invention, it is more profitable to have less prints per detail with larger pads and larger machines.

The invention is described more closely below with the help of some preferred examples of embodiments with reference to the appending drawings in which

Fig. 1 shows a perspective view obliquely from below of a tampon printing pad which is coated with an exactly shaped formation of a metallic layer which lays on its surface and which is to be transferred to the casing of, for example, a pocket telephone and

Fig. 2 shows a partial perspective view of a detail coated with the exact printing pattern of a metallic layer.

The invention is applied according to fig. 1 by a preferably soft and resilient tampon printing pad having been used in the printing method which is used for the transferring of a metallic layer on to the actual detail 8, which pad 1 has a predetermined tailor-made shape, so that it in the main fits, for example, a casing for a pocket telephone. The tampon printing pad 1 is coated with an electrically conducting metallic layer on its surface 3, which extends on chosen places, thus not too close to a display 2 or interconnection means 2' or too near to the hole edges for the number buttons 2'' or where the fittings 2''' are made. This layer 3 is transferred from a preferably etched plate surface. The tampon printing pad 1 can have different shapes with at least one non-flat surface 5 in order to be able to transfer the layer 3 on to different shapes of surfaces which are found in, for example, a detail 8 in the shape of a telephone casing. When the tampon printing pad 1 is pressed against the detail 8, the metallic layer is printed on the predetermined places of the surface of the detail 8.

Fig. 2 shows how it is possible to apply the invention so that the metallic layer 7 is printed by means of tampon printing pad on to the detail 8, whereby the metallic layer 3 ends up exactly in the chosen positions, which are, for example around a hole 10 in a recess 6 and along an arched edge, where an electrical conductor 9 is to be shielded against electromagnetic radiation. Naturally, the detail 8 can appear in many different ways and be coated with metallic layers 7 of varying shapes and appearances. It is also conceivable that the metallic layer 3 can be transferred to the tampon printing pad 1 in a different way, but preferably from an etched plate surface.

If the metallic layer is transferred with the help of a screen printing method then it can naturally be printed directly onto the detail which shall be provided with this

layer without, as is described above, transferring the layer from a screen printed surface with a tampon printing pad.

Through producing the screen frame and its cloth according to the curved surface which is to be coated with a layer, with a predetermined pattern, it is possible to also coat differently shaped surfaces with a layer by screen printing directly onto the detail.

Combinations of the above described printing methods for coating details with a layer which protects against electromagnetic radiation are also possible in order to apply the invention.

The layer coating can also be performed with help of a fluid, for example water, whereby for example a telephone casing which is to be coated, is sunk in a waterbath whereafter the layer is pressed up against the surface of the casing and fixes itself against it. This layer can be produced as a foil and can be connected to a telephone casing which is to be coated before the sinking in the waterbath takes place. In this case the foil fastens on to the telephone casing even if it has curved surfaces.

In the tampon printing method described above, the plate which is provided with the pre-printed picture of electrically conducting paint can be foldable so that during the transferring of the paint to the plate it can have one shape, for example generally flat and when the tampon printing pad is to collect the paint it can have another shape which fits the shape of the tampon printing pad. If the surface such as the interior of a telephone case is curved and complicated then problems occur when printing the metallic layer in the most difficult to approach regions in the nooks and corners of the telephone casing. If the pre-printed plate can be folded so that it is better adapted to the shape of the tampon printing pad then the electrically conducting paint can also more easily be transferred to the intended surfaces on the tampon

printing pad even if these are on an extremely curved surface. The metallic paint can then be pressed against the telephone casings with curved and complicated shapes.

Claims

1. Method of placing a layer (3, 7) on a detail (8), which shields against electromagnetic radiation, **characterised** in that the layer (3, 7) with a predetermined extension directly or indirectly is transferred by means of a known printing method on to the detail (8).

2. Method according to claim 1, **characterised** in that the printing method for the transferring of the layer (3, 7) on to the actual detail (8) is tampon printing, whereby a printing pad (1) made of a compliant material is used for the indirect transferring of the layer (3, 7) to the detail (8).

3. Method according to claim 2, **characterised** in that the layer (3, 7) is transferred indirectly on to the detail (8) from an etched or screen printed surface by means of the printing pad (1).

4. Method according to claims 2 or 3, **characterised** in that the printing pad (1) is formed with a shape which in general corresponds to that of the detail (8) for permitting the transferring of the layer (3, 7) on to a detail (8) having a complicated shape.

5. Method according to claim 4, **characterised** in that the printing pad (1) is made in an extremely compliant material in order to transfer the layer (3, 7) for shielding against electromagnetic radiation on to the extremely uneven foundation of a detail (8).

6. Method according to claim 1, **characterised** in that the printing method for the transferring of the layer (3, 7) to the detail (8) is screenprinting, wherein the transferring takes place directly on to the detail.

7. Method according to claim 6, **characterised** in that during the screenprinting, a screen frame is used, of which the screen cloth is shaped in order to fit an unevenly shaped surface of a detail (8).

8. Method according to claim 1, **characterised** in that the printing method for transferring of the layer (3, 7) to the detail (8) is performed with the help of fluid forming a fluidbath, wherein the detail (8) which is to be coated with the layer (3, 7) is sunk into the fluidbath whereafter the layer (3, 7) is pressed up against the surface of the detail (8) and fixes against it.

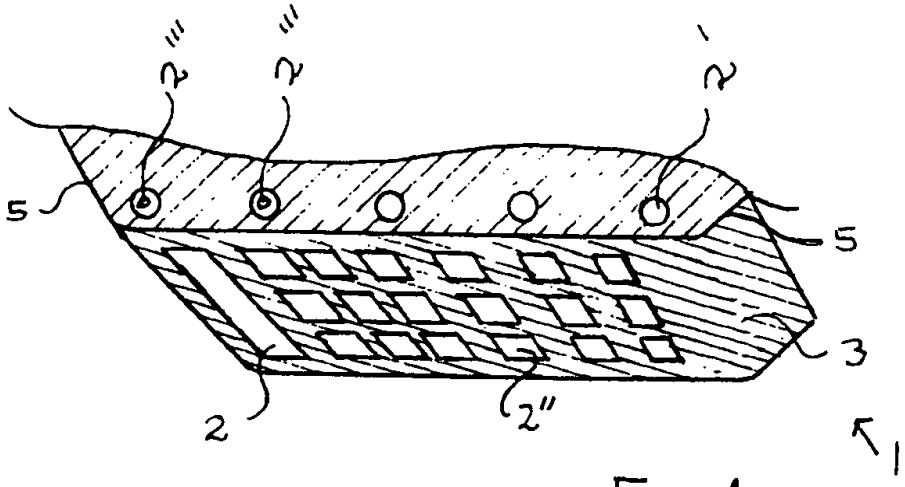

Fig 1.

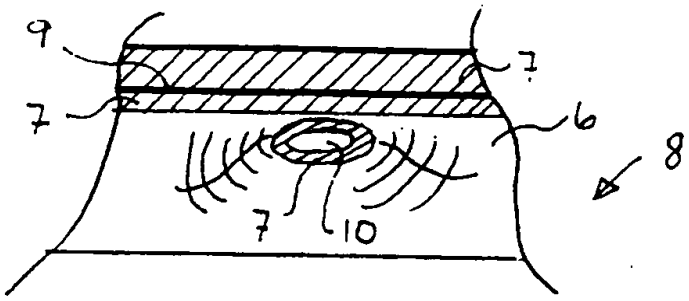

Fig 2.